ART. XV.—*Sneezing: Fallacious Observations.*

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In the last edition of "Foster's Physiology," there occur the following passages:—"Coughing consists in the first place of a deep and long-drawn inspiration, by which the lungs are well filled with air. This is followed by a complete closure of the glottis, and then comes the sudden forcible expiration, in the midst of which the glottis suddenly opens, and thus a blast of air is driven through the upper respiratory passages. The afferent impulses of this reflex act are in most cases, as when a foreign body is lodged in the larynx or by the side of the epiglottis, conveyed by the superior laryngeal nerve. But the movement may arise from stimuli applied to other branches of the vagus."

"In sneezing, the general movement is essentially the same (as in coughing), except that the opening from the pharynx into the mouth is closed by the contraction of the anterior pillars of the fauces, and the descent of the soft palate, so that the force of the blast is driven entirely through the nose. The afferent impulse is usually given from the nasal branches of the fifth." When sneezing, however, is produced by bright light, the optic nerve would seem to be the afferent nerve.

In Landois and Stirling, sneezing is described as consisting "of a sudden violent expiratory blast through the nose for the removal of mucus or foreign bodies (the mouth being rarely open), after a simple or repeated spasm-like inspiration (the glottis remaining open)."

In "McKendrick's Physiology," coughing and sneezing are described as powerful expirations, in which the air is driven through the oral cavity in the first, and through the nasal passages in the second.

"Hermann's Physiology" contains the following:—"The expulsion of foreign particles. Such explosive expiration is called sneezing when the nasal cavities are concerned, and coughing when the irritant is in the larynx."

Each is accompanied by a noise produced by the sudden bursting open of a closed aperture, which in sneezing is found by the opposition of the velum palati to the pharyngeal wall, and in coughing by the opposed vocal cords.

In "Carpenter's Physiology" it is stated "the difference between coughing and sneezing is this, that in the latter the communication between the larynx and the mouth is partly or entirely closed, by the drawing together of the sides of the velum palati over the back of the tongue, so that the blast of air is directed more or less completely through the nose in such a way as to carry off any source of irritation there. Of the purely automatic character of the movement of sneezing there can be no question, since it cannot be imitated voluntarily."

In "Kirk's Handbook of Physiology" we find "the same remarks that apply to coughing are exactly applicable to the act of sneezing, but in this instance the blast of air escaping from the lungs is directed by an instinctive contraction of the pillars of the fauces, and descent of the soft palate, chiefly through the nose, and any offending matter is expelled."

In "Huxley's Elementary Physiology" it is stated "in sneezing, the cavity of the mouth is described as being shut off from the pharynx by the approximation of the soft palate and the base of the tongue, the air being forced through the nasal passages."

All these writers, then, are agreed in describing sneezing as a modified respiratory act, in which air is blown through the nose, and most of them assume that it consequently serves the purpose of driving irritating substances from the nose.

On the other hand, in one of the most recent works on the diseases of the nose (Greville MacDonald, published 1892), one finds the following reference to sneezing:—"Again, it may be doubted whether the physiological reflexes can be considered in any way beneficial. Sneezing, it may be argued, is not of any use in driving irritating particles from the nose, seeing that it consists essentially in a closing of the palate during spasmodic expiration, and thus prevents the current of air from passing through the nose. But we probably find the most accurate explanation

of the phenomenon in the following considerations:—On the entrance of an irritating particle into the nose, the primary object of the reflex phenemonon is to increase the flow of mucus, not only for the sake of interposing some non-irritating substance between the sensitive membrane and the foreign particle, but even more for the purpose of washing it away. This increased flow is produced by a double mechanism. In the first place there is a supply of more blood, and the stimulation of the secreting cells, through nerve influence; and in the second, there is an increase of vascular pressure from over-filling of the venous sinuses, as described in Chapter I. Now, this pressure on the venous sinuses must be enormously increased by the convulsive respiratory act comprised in sneezing. This latter consists in a violent contraction of the diaphragm, &c., together with the closing of the glottis and the post-nasal space, by contraction of the velum and the superior strictors and of the buccal orifice by the approximation of the tongue firmly to the teeth and hard palate; in fact, every possible movement is thrown into action to prevent the exit of air from the larynx, mouth, and nose. What is the immediate consequence of this? Increase of the intra-thoracic pressure, which necessarily increases the intra-vascular tension, especially in the veins, and hence in the venous sinuses of the nose. The act of forcible expiration, with all the outlets from the thorax closed, if voluntarily induced, *i.e.*, without the preliminary irritation in the nose, is scarcely operative in producing the effect described, and it is probably only when the nerve stimulation is excited at the same time, and the gland cells are set working, that this increase in the venous pressure is of some additional assistance."

Reviewing these conflicting statements, we find difference in matters of fact, and necessarily in the inferences drawn from them. Of the inaccuracy of the description of sneezing given in "Foster's Physiology" and the other works referred to, there can be no question. The process seems to be similar to that followed in coughing, with the following amongst other distinctions:—(1) That it is entirely involuntarily. (2) That it is caused mainly through stimulation of the anterior portion of the nose. Stimulation of the posterior portion of the nose generally results in coughing. (3) That the forced expiration is, if anything, more marked than in coughing. (4) That the air in persons with normal palate (and apart from voluntary efforts modifying the act) is

driven entirely through the mouth; that is to say, that the palate is probably pressed firmly back against the pharynx so as to completely cut off communication with the nose. The peculiar noise made in sneezing is probably produced by the impact of the imprisoned air on the back of the hard palate, combined with certain modification of the shape of the mouth produced by movements of the tongue and lips. In coughing, on the other hand, it would seem that the communication between the nose and throat is not necessarily cut off, and that the air sometimes passes through the nose as well as the mouth, and that special movements of the lips and tongue are certainly different, if not absent altogether. The mouth is generally opened more widely in coughing, and the noise produced by a cough is very different from that produced in sneezing. The one is laryngeal in the main, the other is chiefly buccal.

It is possible that the glottis has nothing to do with sneezing, and that the obstruction is entirely pharyngeal. If, however, there is a closed glottis, it is probable that the mode in which it is opened in the two cases is somewhat different. Coughing has, at all events, sometimes a definite object to serve. It serves for the removal of irritating particles from the air passages, and it is quite likely that the glottis may be differently disposed in sneezing. Hence the absence of glottic noise in sneezing. The statement that the blast of air in sneezing is driven through the nose has originated, I think, in the following manner:—The observations have been necessarily almost entirely personal, and as usual the introspective method, if the term can be used in this sense, has again proved fallacious. When people sneeze, they feel first a profound irritation in the anterior part of the nose. If this persists, there follow some long and deep inspirations, then a violent expiratory effort with possible closure of the glottis or some part of the pharynx; the obstruction is suddenly overcome, and the air expelled through the mouth with the characteristic noise. Usually there follows almost immediately a gush of watery fluid from the nose, which is evidence of increased secretion.

Now, putting these facts together, those who first described the process of sneezing, confused as usual inference and fact. They knew that coughing, at all events, served the one purpose of removing foreign bodies from the air passages. They inferred justly or unjustly that sneezing was adapted to remove foreign bodies from the anterior portion of the

nose by means of the blast of air. They felt the irritation of the nose, and found that sneezing was usually followed by relief. Without examining carefully the act of sneezing, to see whether the air did or did not go through the nose, they assumed that it did, hence the description. It is of course possible that, in some cases where observation was made, abnormal conditions of the palate may have permitted portions of the air to get to the nose. As the act of sneezing is involuntary, while that of coughing is not, it is impossible to study the phenomena of the former, except in an impromptu and largely subjective manner. The vocal cords can be examined with the laryngoscope in coughing, but not in sneezing. Objective examination in sneezing is very limited, by reason of the nature of the act. It seems to me, however, perfectly clear that we have another example of the manner in which hypothesis has biassed observers. They have unconsciously endeavoured to make the facts fit the theory. An observation once made and stated by a competent authority has probably been copied from one work into another, until of late years the great importance given to physiological respiratory reflexes by physicians has caused the matter to be more closely investigated.

Greville MacDonald's ingenious theory of the value of sneezing, physiologically, may or may not be accurate. The fact, however, that patients suffering from eye disease frequently sneeze when exposed to a strong light, indicates the necessity for caution before assuming that sneezing has any value whatever. It may have as little to do with normal physiological function in the human being as apparently has the patellar reflex, the cremasteric reflex, or some other of the general reflexes. If sneezing is essential to the removal of a foreign body from the anterior portion of the nose, it is very difficult to understand why coughing or blowing through the nose would not be equally serviceable. As Greville MacDonald justly observes, "it is quite certain that sneezing alone cannot produce the rush of fluid from the nose. It requires a local determining agent. At present, it seems to me the only conclusion that can be safely arrived at, is the Agnostic one." Greville MacDonald's explanation is plausible, and has the merit, as far as I know, of standing alone.

How much more fallacious observation of a similar character exists in all departments of science, it is impossible to conjecture, but I think it fairly certain that, if the

treatment of diseases of the nose had not become organised into a special department of medicine, it would have been assumed that the significance of the respiratory reflex was fully understood. My object in drawing attention to the matter is—(1) To put the facts, as far as possible, before members. (2) To stimulate observation, which from the necessity of the case must be largely personal. (3) To give another example of the manner in which good observers are biassed by the teleological assumption. (4) Of the manner in which such fallacious observations lead men to accept explanations which wrongly colour the work of those who have to apply them in practical life. An accurate statement of facts with regard to sneezing, would probably have stimulated inquiry into the relation between nasal disease and asthma, at a much earlier date than 1871, when attention was first drawn to the matter by Voltolini.